

AN APPRAISAL OF THE APPRENTICE TRAINING
PROGRAM IN A NAVAL INDUSTRIAL PLANT

Samuel Thomas Armstrong

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AN APPRAISAL OF THE APPRENTICE TRAINING PROGRAM
IN A NAVAL INDUSTRIAL PLANT

A Thesis

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of

Purdue University

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ABSTRACT

The objective of this study was to make an analysis and criticism of the apprentice training program of the Naval Ordnance Plant, Indianapolis, Indiana, with the considered possibility of using this study as a guide for establishing apprentice training in other Naval industrial activities. The criteria upon which this analysis was based included the programs and standards of organizations recognized as outstanding in the apprentice training field, current publications on the subject of apprentice training, and conferences with people active in the field of apprentice training.

The majority of the material upon which the investigation is based was obtained at the Naval Ordnance Plant. Study of the training files, conferences with the Training Director, Supervisor of Apprentices, members of the Apprentice Training Committee, and observation of apprentice instruction in the classroom and in the shop resulted in a thorough coverage of the training program operations. The information gathered and the procedures observed were then compared with the criteria of generally accepted practices in apprentice training.

The results of this study are considered worthwhile. In terms of the criteria used, the Naval Ordnance Plant, Indianapolis, Indiana has a well planned and smoothly

operated program. For industrial activities of similar size, the practices of this plant might readily be applied in setting up a similar program. Considering the needs of the Naval Ordnance Plant, it can be concluded that the present program is very satisfactory and only minor adjustments in the program are deemed desirable.

AN APPRAISAL OF THE APPRENTICE TRAINING PROGRAM
IN A NAVAL INDUSTRIAL PLANT

INTRODUCTION

Apprenticeship in America can be traced to colonial days and in the United States Navy from the earliest days of American independence. In the 1790's there were naval apprentices in the Washington, Philadelphia, and New York shipyards.

Apprenticeship, as a method of training skilled craftsmen, never reached the degree of importance in America that it enjoyed in Europe. Indeed, with the inception of the machine era apprenticeship began a general decline as shown by Census statistics for the period 1860 to 1940.

<u>Year</u>	<u>Number of apprentices</u>	<u>Total labor force</u>	<u>Ratio</u>
1860	55,326	1,850,034	1:33
1880	44,170	3,837,112	1:87
1890	82,057	5,091,293	1:62
1900	81,603	7,112,987	1:88
1910	118,964	11,623,605	1:98
1920	140,400	13,922,102	1:100
1930	77,452	15,094,080	1:196
1940	92,360	16,374,676	1:180 ¹

This general decline in the training of craftsmen was due primarily to the large scale immigration of skilled

¹Alfred Kahler and Ernest Hamburger, Education for an Industrial Age (Ithaca and New York: Cornell University Press, 1948), p. 20.

European workers. In addition, during the depression days of the 1930's there was an excess of skilled labor obviating the need for training. With the coming of World War II American industry found itself in the position of being forced to expand its production capacity with an inadequate labor supply and an inadequate system for acquiring skilled labor.

In 1937 the Fitzgerald Act was passed which established the Bureau of Apprenticeship, U. S. Department of Labor. It was established for the purpose of encouraging and assisting industry in setting up systems for the training of apprentices.

With the lesson of World War II, the increased demands of post-war production, and the encouragement of the Federal government, apprenticeship training is today receiving a renewed emphasis in American industry. As of June 30, 1952, there were 158,387 apprentices registered with the Bureau of Apprenticeship. "Registration is voluntary. Some employers, especially in the metal trades, have not formally registered their apprentices. Therefore, detailed information is not available concerning the number of unregistered apprentices in all trades. However, it is estimated that the number of unregistered apprentices in the United States is approximately one-fifth the number of registered apprentices."² Assuming that this estimate is correct, there are

²Technical Bulletin No. T-134, Registered Apprentices in the United States, Detailed Occupational Distribution,

approximately 190,000 apprentices in America today.

The U. S. Navy, one of the largest employers of civilian labor in the world, has always been active in the field of apprentice training in its Naval shipyards. In recent years, however, the Navy has acquired a number of new production facilities to provide the specialized technical equipment demanded by modern warfare. As a result, the problem of training skilled craftsmen in these new plants has arisen. It is the object of this study to show how one Naval industrial plant approached the problem.

The apprentice training program of the Naval Ordnance Plant, Indianapolis, Indiana was initiated in 1946. Since that time it has continually progressed and is now acknowledged as being one of the most advanced and smoothly operating programs in the state of Indiana.

This study was originally undertaken with the intent of evaluating the selection and instructional procedures of the program, but the inconsistencies and lack of records of the first apprentice classes prevented completion of this goal. However, it was felt that a description and evaluation of this apprentice training program development would be of value to other activities, both Naval and civilian, interested in developing an apprentice training program.

June 1952 (Washington, D. C.: United States Department of Labor, Bureau of Apprenticeship, September 1952), p. 2.

Consequently, the present objective of this study is to (1) describe the phases of the program, (2) describe the evolution of the unique procedures, and (3) compare training methods of the plant with generally accepted practices in industry.

DEFINITION OF APPRENTICE TRAINING

The term "apprentice training" is one that has been commonly used through the years but seldom very carefully defined. As a result, there has been considerable variation in its concepts. Until the advent of the machine era, apprenticeship was considered as "a process of learning by doing, under which a minor was taught the art of a trade by one who was at the moment engaged in it; the minor paying either in whole or in part for this instruction by the work done on objects destined for the master's consumption or sale."³ Although parts of this definition still apply, the age of apprentices and the training conditions have undergone extensive change.

For those programs that are registered with the Bureau of Apprenticeship, the following general definition of apprentice is now accepted: "The term 'apprentice' means a worker who learns, according to a written agreement, a recognized skilled trade requiring two or more years of work experience on the job through employment, supplemented by appropriate related trade instruction."⁴

³Paul H. Douglas, American Apprenticeship and Industrial Education (New York: Columbia University Press, 1921), p. 11.

⁴"United States Department of Labor, Bureau of Apprenticeship, 1952" The National Apprenticeship Program (Washington, D. C.: United States Government Printing Office 1952), p. 2.

For the purposes of this report, the definition of apprentice training used by the United States Navy will be accepted which is as follows: Apprentice training is "training designed to give thorough instruction to a learner in the principles and practices of a particular trade or craft as well as in academic and related subjects."⁵

⁵Navy Civilian Personnel Instructions, Instruction 230
(Washington, D. C.: Navy Department, Office of Industrial Relations, 20 March 1952), p. 1.

THE NAVAL ORDNANCE PLANT, INDIANAPOLIS, INDIANA

Description and Brief History

The Indianapolis Naval Ordnance Plant, commonly referred to as "NOPI", is located in the northeast suburbs of Indianapolis, Indiana, at the corner of Arlington Avenue and Twenty-first street. The main plant structure consists of a three story administrative building, a single level manufacturing building, a cafeteria, and a garage and maintenance paint shop. Other buildings located on the station, but not attached to the main plant, are a powerhouse, an experimental laboratory, and a number of small utility buildings. Figure 1 shows an aerial view of the NOPI buildings and grounds.

Construction plans for NOPI were originally drawn in 1936, but World War II began before the Navy Department could complete construction. Consequently, the plant construction and operation was turned over to the Carl L. Norden Corporation, a Navy contractor for the production of the Norden Bombsight. Known as the Lukas-Harold Corporation, the plant operated under civilian management until 1945, at which time it reverted to complete naval operation and was converted to accomplish the mission originally intended — a shore establishment for research in and engineering development of aviation ordnance fire control equipment, the manufacture, overhaul, modification and

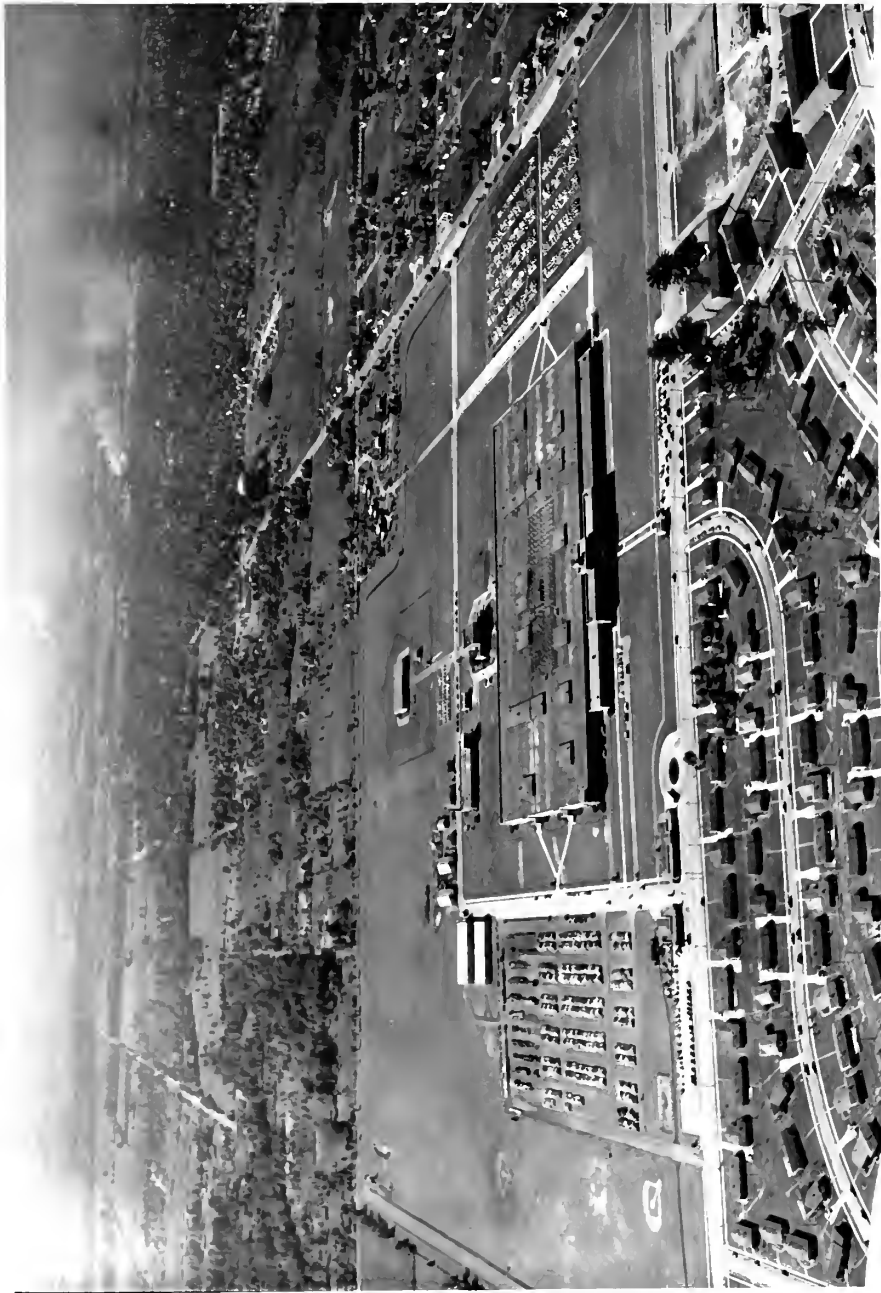


FIGURE 1
AERIAL VIEW OF NAVAL ORDNANCE PLANT, INDIANAPOLIS, INDIANA

modernization of fire control instruments, including radar equipments and accessories.

Organization

NOPI is operated by and for the Bureau of Ordnance, United States Navy. In order to exercise the closest possible liason and control over the plant operations, a professional Naval officer acts as plant manager. This position is rotated among qualified naval officers at approximate two year intervals. However, in order to give the organization a degree of permanence, the remainder of departmental and supervisory positions are for the most part held by civilian personnel.

Figure 2 shows an organization chart of the plant with the position of those departments emphasized that are directly concerned with apprentice training.

The engineering department of NOPI, due to its function of product development, is quite large and employs a number of small "model shops" which utilize the services of skilled craftsmen.

The industrial department is charged with the responsibility of manufacturing the output of the plant, and in this capacity employs approximately one-half of the three thousand employees of NOPI. The production division of this department is divided into four branches; salvage, assembly, machining, and tooling. The great majority of

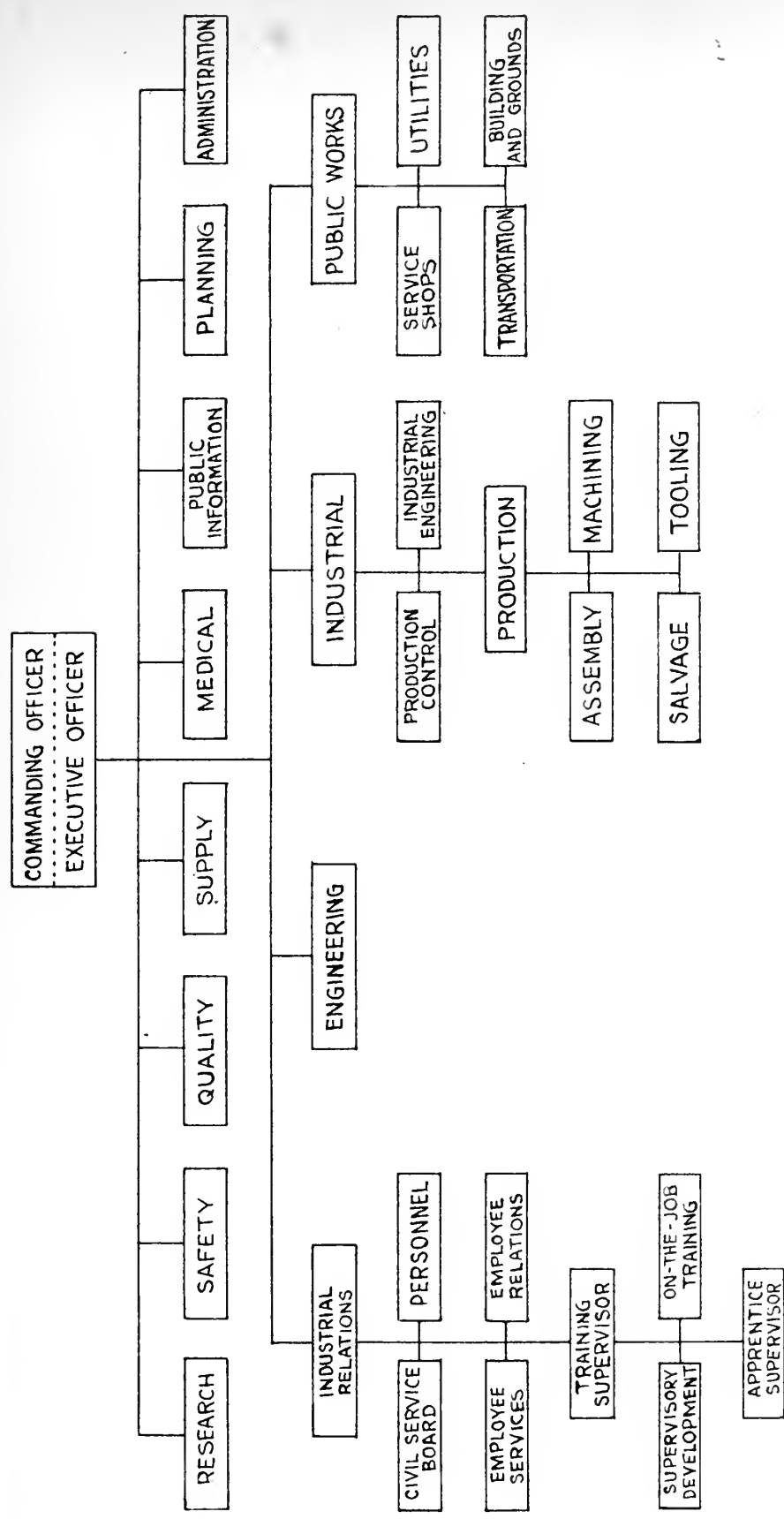


FIGURE 2
 ORGANIZATION CHART
 OF
 NAVAL ORDNANCE PLANT, INDIANAPOLIS, INDIANA

the skilled craftsmen of the plant are in the production division.

The industrial relations department is organized along conventional lines. One exception to this is the position of recorder, U. S. Civil Service Commission. Since all employees are under Civil Service, this division processes the applications and examinations of all new employees.

The training division is responsible for the organization and supervision of on-the-job training, supervisor training, apprentice training, and other training programs deemed necessary by management.

The public works department is responsible for the maintenance of the plant. The service shops division is responsible for machine repair, electrical instrument repair, plant plumbing, and general maintenance. The utilities division maintains the electrical sub-station, the powerhouse, and the air conditioning system. The transportation division maintains all motor vehicles. The building and grounds division is, as the title implies, responsible for maintenance of the buildings and grounds.

Navy Civilian Personnel Instructions

The Office of Industrial Relations is a subdivision of the Executive Office of the Secretary of the Navy. Its primary function is to advise the Secretary of the Navy on all matters pertaining to the administration of the civilian

employees of the Navy, to prepare and recommend to the Secretary appropriate policies and procedures governing civilian employees, and interpret for civilian employees the policies of the Navy that directly affect them.

The principal method by which the Office of Industrial Relations promulgates the policies of the Secretary of the Navy is by issuing and keeping current a complete set of instructions for the administration of civilian employees. These instructions comprise fifty printed, loose-leaf chapters which are numbered and titled by the subject matter covered and are known collectively as the "Navy Civilian Personnel Instructions (NCPI)". These instructions are based on and limited by applicable statutes, court rulings, and the rules and regulations of the U. S. Civil Service Commission and are designed to accomplish two things: "(1) adapt basic laws, regulations, etc. applicable to all government agencies, to the specific needs of the Navy: and, (2) provide operating officials with one place to look for guidance in all civilian personnel matters."⁶

Instruction 230, Section 10, of Navy Civilian Personnel Instructions outlines the Navy's policies and regulations for apprentice training. These regulations are broad in scope, primarily setting forth minimum standards to be

⁶Office of the Comptroller of the Navy, Department of the Navy, The Naval Establishment, Its Growth and Necessity for Expansion, (Washington, July 1951), p. 76.

followed, and allowing a wide latitude of program development to the local training supervisor. Therefore, it may be seen that the NOPI training program was developed under much the same conditions as would apply in a private industrial enterprise — very little regulation with full responsibility for the program development in the hands of the training department.

The United States Civil Service Commission

The Pendleton Act of 1883 established the United States Civil Service Commission for the purpose of selecting federal employees by open, competitive examination. In later legislation the duties of the Civil Service Commission were expanded to include promotion and retirement supervision of federal employees.

To take care of the workload, the commission has divided the United States into districts. Within the districts, organizations which have a large volume of hiring are sometime allowed to establish a local Board of Examiners. This local board working under the direction of the Civil Service Commission District Office gives examinations, scores the results, and establishes registers from which applicants are hired.

NOPI has been permitted to establish such a local Board of Examiners. The Assistant Industrial Relations Officer is Recorder of the Board and in this position is in charge

of examination of apprentice applicants.

The Apprentice Training Program

Need and Establishment of Program. When the Navy assumed operation of NOPI during 1945, it was with the announced purpose of establishing a permanent center for the development of aircraft fire control systems. Accordingly, the management of NOPI took a long range attitude in respect to its future operations. In analyzing the labor needs of the plant, it was found that the Indianapolis area labor market could not be relied upon to furnish craftsmen with the precision skills necessary for the production of the intricate mechanisms found in fire control equipment. Therefore, it was decided to establish an apprentice training program for the purpose of developing highly skilled artisans, future key employees, and supervisors.

An apprentice committee was formed and was charged with the responsibility of formulating an adequate apprentice program. The training supervisor, as coordinator of the committee, contacted the state representative of the Bureau of Apprenticeship, Department of Labor, and it was in cooperation with this agency that the original standards were established.

In August 1946 the training program was evolved by the committee, approved by the Office of Industrial Relations, and in December 1946 the first apprentice group of twenty

men was started in the following trades: machinist, toolmaker, electrician, draftsman, and air conditioning mechanic.

Apprenticeable Trades. Since the inception of the apprentice training program at NOPI, the program has been gradually revised and expanded. Today, there are ten trades apprenticeable. They are:

1. Air conditioning mechanic.
2. Draftsman.
3. Electronic mechanic.
4. Electrical mechanic.
5. Fire control mechanic.
6. Instrument maker.
7. Machinist.
8. Plumber.
9. Sheetmetal worker.
10. Toolmaker.

There have been six apprentice classes at this writing with one hundred and two apprentices distributed as shown in Figure 3. From this chart it may be seen that trades greatest in demand at NOPI are: electronic mechanic, fire control mechanic, machinist, and toolmaker.

The Apprentice Board of Review. The Apprentice Board of Review was originally established as the Apprentice Training Committee and was given the responsibility of formulating the apprentice training program. It was the

GROUP	DATE STARTED	ENROLLMENT										TOOL MAKER	SHEETMETAL WORKER	PLUMBER	MACHINIST	INSTRUMENT MAKER	FIRE CONTROL MECH.	ELECTRICAL MECH.	ELECTRONIC MECH.	DRAFTSMAN	AIR COND. MECHANIC	ENROLLMENT	DATE STARTED	GROUP
		I	II	III	IV	V	VI	VII	VIII	IX	X													
I	DECEMBER 1946	20	2	2	2	2	1				1	8												
II	JUNE 1948	15					1	8				3	1											
III	NOVEMBER 1948	13					2	1	5			1												
IV	MAY 1950	14				1	3					5	2											
V	JULY 1951	20						2	1			17												
VI	AUGUST 1952	20				1	7		4			6	2											

FIGURE 3
DISTRIBUTION OF APPRENTICES
NAVAL ORDNANCE PLANT, INDIANAPOLIS

feeling of management that this committee should represent all departments having contact with the apprentice. Therefore, the following people were appointed to the committee:

1. The Executive Officer
(representing top management).
2. The Tool Division Head.
3. Assembly Division Head.
4. Maintenance Division Head.
5. Machining Division Head.
6. Engineering Department Head.
7. The Training Supervisor.

The duties of the Board of Review were outlined as follows:

It shall be the responsibility of the Board of Review:

- a. To cooperate with the Supervisor of Apprentices in passing on the qualifications of applicants for apprenticeship.
- b. To approve applicants as apprentices.
- c. To cooperate with the Supervisor of Apprentices in carrying out his duties.
- d. To review and make recommendations relative to any determination of credit in connection with an apprentice's basic experience.
- e. To consult and advise with any apprentice or the Supervisor relative to the individual problems of apprentices properly referred to them.
- f. To certify the satisfactory completion of apprenticeship and recommend the issue of Certificates of Completion of Apprenticeship by the Registration Agency.
- g. To perform such other functions as may be necessary in regard to the apprenticeship program.⁷

⁷United States Naval Ordnance Plant, Indianapolis, Indiana, Apprenticeship Standards, (Indianapolis, Indiana, 1952), p. 2.

The training officer acts as recorder of the committee. Monthly and special called meetings are held to perform the described functions and to make revisions and improvements in the program.

The Supervisor of Apprentices. The Supervisor of Apprentices is the person directly in charge of operation of the Apprentice Training Program. His functions have been outlined as follows:

The duties of the Supervisor of Apprentices shall be:

- a. To interview applicants and receive applicants for apprenticeship.
- b. To present to the Board of Review apprentice applications selected on the basis of the ability and qualifications of the applicants, and, upon Board of Review approval, to place such applicants on the payroll as apprentices.
- c. To assure apprentices of a variety of experience as outlined in the schedule of work processes, and to make sure that they are properly instructed in their trade.
- d. To maintain adequate records of all apprentices, indicating their progress and listing the distribution of their time in various kinds of work.
- e. To review the record of the apprentice's related technical work and to inform the Board of Review periodically of the progress of each apprentice.
- f. In cooperation with the Board of Review, to conduct periodic examinations.⁸

Probably his most important function is the direct supervision of apprentices. It is the Supervisors custom to make a daily tour of the plant observing the work processes being performed by the apprentices. By this daily contact it is possible to insure that the apprentices are

⁸Ibid., p. 3.

receiving adequate shop training, by judiciously placing the apprentice in those departments that are performing processes outlined by the syllabus.

To aid him in distributing the employees about the plant and keeping a picture of the work processes they are performing, the supervisor of apprentices maintains two wallboard charts which are shown in Figures 4 and 5.

Figure 4 shows the Master Progress Chart which is a plan view of the plant. Each department involved in apprentice training is color coded on the plan. Each apprentice trade is also color coded and each apprentice has a tag bearing his name. As the apprentices are distributed among the departments, their tag is pinned in the appropriate space, thus showing at a quick glance the location and work processes being performed by the apprentices.

Figure 5 shows a master record of each apprentice class. Along the ordinate are listed the names of the apprentices and along the abscissa are listed the required work processes for the trade. As an apprentice completes a process, the number of hours and date of completion are entered. This board gives a ready picture of the individuals progress and the work processes which he has as yet to complete.

Apprenticeship Standards. The Training Department of NOPI has published the standards of its apprentice training program in booklet form. The standards include the

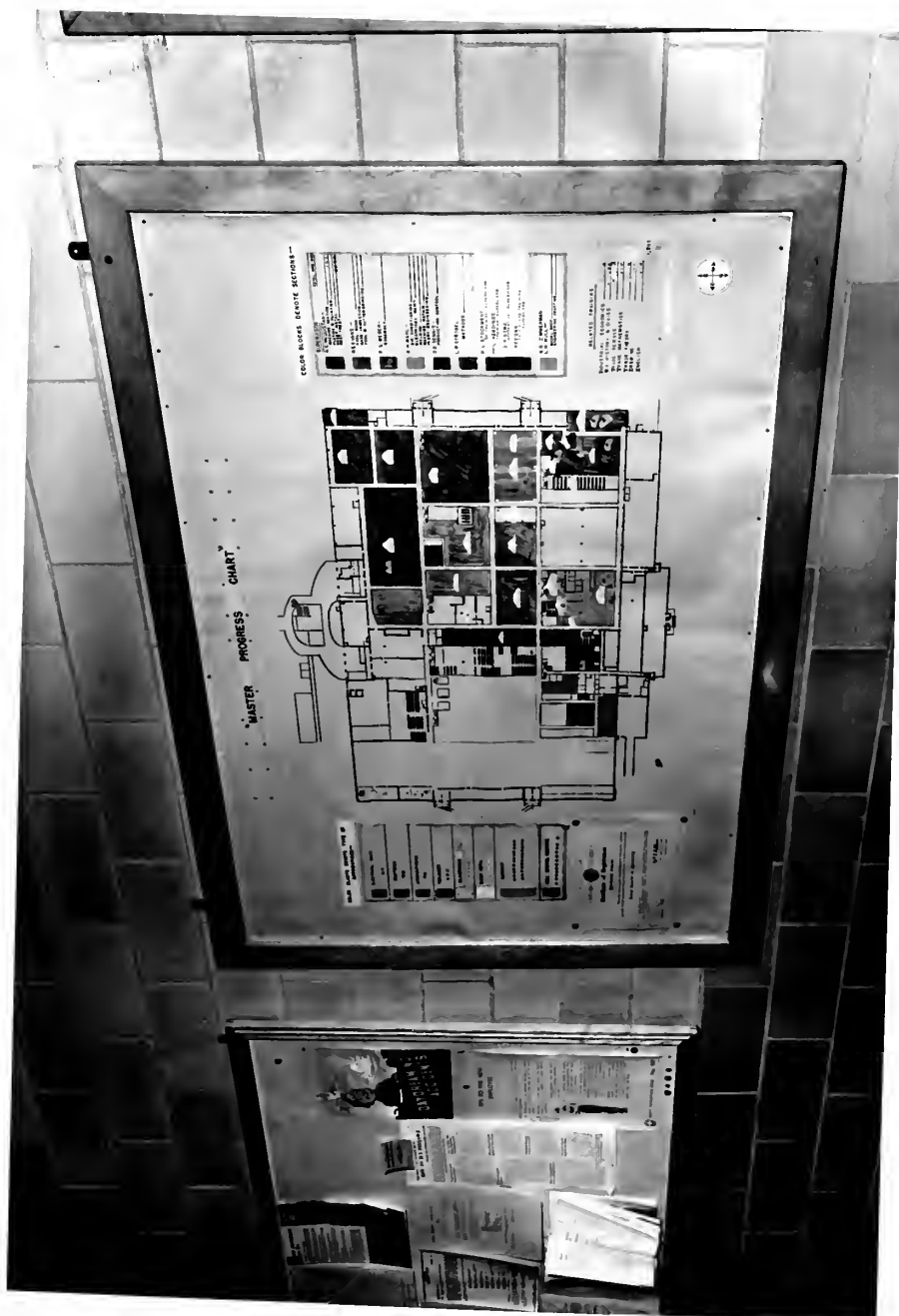


FIGURE 4
MASTER PROGRESS CHART

The image shows a large, rectangular master apprentice record chart mounted on a wall. The chart is divided into two main sections: "APPRENTICESHIP CLASS OF MAY 1950" on the left and "APPRENTICESHIP CLASS OF NOV. 1948" on the right. Each section contains multiple rows of tables for tracking academic and practical progress. The tables include columns for "CLASS AND YEAR COMPLETED", "ACADEMIC - SUBJECTS", "APPROPRIATE - SUBJECTS", and "CLASS AND YEAR COMPLETED". The chart is mounted on a wall with a tiled border.

FIGURE 5
MASTER APRENTICE RECORD CHART

apprentice qualifications, term of apprenticeship, duties of persons connected with the program, training conditions, outline of the shop and related training for each trade, and other information of interest to the apprentice.

The qualifications for apprenticeship are:

- a. American citizenship.
- b. Must successfully pass Civil Service examinations and be accessible on Civil Service Register.
- c. Age - - - Applicant, other than veteran, must have reached his sixteenth birthday and not have passed his twenty-second birthday on the date of application. No age limit for veterans of World War II.
- d. Physical fitness to perform required duties.⁹

Apprenticeship Agreement. As an indication of good intent, an Apprentice Agreement is drawn up between the apprentice and the Commanding Officer of NOPI. Although this agreement is not legally binding on either the apprentice or NOPI, it does set forth the expected relationship between the two parties. Figure 6 shows a copy of the apprentice agreement.

Selection. The Apprentice Committee at periodic intervals and when the need arises, makes recommendation to the Commanding Officer that new apprenticeship classes be started. After verifying the need, the Commanding Officer requests approval of apprentice employment from the Office of Industrial Relations.

While awaiting approval for the new class, the Recorder, Board of U. S. Civil Service Examiners issues an announcement

⁹Ibid., p. 1.

TRAINING AGREEMENT

THIS AGREEMENT, entered into this _____ day of _____,

19 ____ between _____, hereinafter
(Employer)

referred to as the EMPLOYER and _____
(Apprentice)

born _____ hereinafter referred to as the
(Date of Birth)

APPRENTICE, and (if a minor) _____,
(Name of Parent or Guardian)

hereinafter referred to as PARENT OR GUARDIAN.

WITNESS, that the EMPLOYER agrees to employ and train, and the APPRENTICE AGREES to perform the work of the trade or craft diligently and faithfully during the term of Training in accordance with the terms and conditions of the Training Standards hereto attached and made a part of the Agreement.

Trade or Craft _____	Term of Training _____
----------------------	---------------------------

Credit for previous Experience in Trade or Craft _____	Training Period Remaining _____
-----------------------------------------------------------	------------------------------------

Remarks _____

IN WITNESS THEREOF, the parties hereunto set their hands and seals
this _____ day of _____, 19 ____.

(Apprentice)

(Employer)

(Address)

(Address)

(Parent or Guardian)

(Officer of Company)

that applications for apprentices in the desired trades are being accepted. When approval from the Office of Industrial Relations is received, applicants are notified that examinations will be on a given date.

A Trades Interest questionnaire is sent to each applicant prior to his reporting for examination. The questionnaire consists of one hundred and sixty questions or statements of apparently unrelated odd jobs a person might come in contact with in everyday life. For each statement, the applicant must check whether he likes, dislikes, or is indifferent to the job and as to whether he is well informed, partially informed, or has no knowledge of the job. The applicant gives this questionnaire to the Supervisor of Apprentices upon reporting for examination. It is then evaluated by the Supervisor of Apprentices to gain an insight into the applicants natural interest in the apprenticeable trades.

The formal examination is scheduled for seven hours. The first portion is a multiple-choice, four and one-half hour examination which concentrates on arithmetic, algebra, geometry, and trigonometry. There are one hundred and fifteen questions in this section.

The second portion of the examination is a multiple-choice, two and one-half hour examination covering mechanical aptitude, pattern matching, synonyms, English usage, spelling, and history and civics.

Results of this examination are weighted and a Civil Service Register is established according to score received. Those applicants receiving a score of seventy and above are then interviewed by the examining committee. The Examining Committee composed of the Supervisor of Apprentices and The Board of Review bases its selections on test results, the Trades Interest questionnaire, the application form, a physical examination, and interview impressions.

Prior to the class of May, 1950, all apprentices were drawn from employees within the plant. Since these employees had already been accepted for Civil Service Employment, it was considered unfeasible to give the Civil Service examinations. Being uncertain as to the best approach of selecting apprentices, the training supervisor contacted the Director of Vocational Education of the Indianapolis Public School System for aid in developing selection procedures. This office in turn recommended and conducted selection examinations for NOPI. The test battery used consisted of:

1. The Otis Quick-Scoring Mental Ability Test - Gamma Test.
2. The Revised Minnesota Paper Form Board Test.
3. The Johnson Temperament Analysis.

An individual interview by the Apprentice Committee was used in conjunction with test scores to determine those selected.

Related Classroom Training. The Related Classroom

Training of the NOPI Apprentice Program receives somewhat more weight than that given in the great majority of apprentice training programs. Total school hours required during each apprenticeship year range from a minimum of one hundred and sixty hours to a maximum of four hundred and fifty-two hours, depending upon the academic ability of the apprentice. [Academic ability is determined by entrance examination for each course. Results of these examinations along with an appraisal of the apprentices experience are used to determine credit for reduction of related training.] These requirements are standardized throughout the Navy by Navy Civilian Personnel Instructions in total number of hours, however, the subjects taught and the distribution of hours devoted to each are left to the discretion of the local training officer.

For the apprentice who takes the complete course, the NOPI related training hours are distributed for the four year period as follows:

<u>Subject</u>	<u>Hours</u>
History and Civics	120
English	440
Trade Theory	284
Trade Mathematics	300
Trade Science	200
Trade Drawing	284
Elementary Supervisor Appreciation	80
Total	1,808 ¹⁰

The History and Civics course is given with the

¹⁰Ibid., p. 74.

objective of creating a more civic minded citizen with the ability to understand and appreciate governmental actions that affect him as a government employee.

The English course is designed to improve the apprentice's ability to express himself correctly and effectively in both oral and written form. Although the principles of grammar and composition are taught, major emphasis is placed on the practical aspects of the subject. Instruction includes: (1) analyzing orders, directives and memoranda; (2) briefing trade articles; (3) writing specifications; (4) giving trade talks; (5) letter writing and penmanship; and, (6) preparing job orders.

The Trade Theory course includes information relative to the care, operation, and preservation of mechanical equipment, materials and their characteristics and terminology. This instruction is timed to coincide with shop practices being taught the apprentice.

The Trade Mathematics course is held to essentials which have application to the trade, and which are necessary to the successful practice of the trade at any level with major emphasis placed on geometry and trigonometry.

The Trade Science course deals with applied science. It includes knowledge essential to skilled artisans with major emphasis placed upon mechanisms.

The Trade Drawing course objective is to give the apprentice proficiency in the reading of all types of shop

blueprints. The instruction includes free-hand shop sketching, orthographic projection, evolution of views, pattern layout, and isometric drawing from shop parts.

The objective of the Supervisor Appreciation course is to prepare the apprentice for future leadership responsibilities by making him cognizant of the many facets of modern day supervision.

Classroom instruction is held during working hours in four well-equipped classrooms approximately fifteen by twenty-five feet in size. Figure 7 shows a view of one of the classrooms.

Apprentices also have access to the plant technical library. This library is maintained primarily for the Engineering Department, but texts and periodicals relevant to the apprentice's needs are also carried. Figure 8 shows a view of the library.

Until 1949 related training instructors were provided by the staff of the Engineering Department. This procedure was found unsatisfactory from the Training Department standpoint in that (1) the instruction tended to be inconsistent and disconnected due to the rapid turnover of instructors, and (2) it was difficult to maintain adequate records of instruction. From the Engineering Department point of view it was unsatisfactory due to the fact that the engineer was often involved in apprentice instruction when his services were needed on department projects.



FIGURE 7
RELATED TRAINING CLASSROOM

FIGURE 8
TECHNICAL LIBRARY



In order to improve this situation, NOPI in 1949 entered an agreement with the Indianapolis Public School Board and the Veterans Administration whereby the School Board furnishes NOPI with two accredited high school teachers to teach related trade subjects. This arrangement was possible due to the fact that all apprentices at that time were veterans and were taking apprentice training under Public Law 346, the GI Bill.

An advantage to the apprentice of this system was that if he attained suitable proficiency in the related training subjects, he was given high school credit and upon completion of apprentice training was given a diploma from Emmerich Manual Training High School of Indianapolis, Indiana, provided he did not already possess a high school diploma.

Shop Training. Shop Training is the training given the apprentice on the job. It is training through doing; the actual operation of machinery and equipment under the supervision of a journeyman instructor.

Shop Training makes up the major portion of the apprentice curriculum. The balancing of work experience and caliber of shop instruction are key factors in the quality of the apprentice program.

The Apprentice Committee in setting up the program in 1946, charged the department heads most closely associated with the apprenticeable trades with the responsibility

for the formulation of shop training syllabi. For example, the master of the tool division formulated the toolmaker shop syllabus; the master of the machine division formulated the machinist syllabus, etc.

The determination of the types of work training to be given and the number of hours in each phase is a difficult problem. It is in the final analysis a compromise between general practices in other industries, the basic requirements of the craft, and the specific needs of the plant.

Since several of the crafts are results of the more recent technological developments, determination of a well-rounded course of instruction was evolved through trial and error. An example of this is the following comparison of the Electronic Mechanic syllabus for the years 1948 and 1952.

<u>Phase of Training</u>	<u>1948</u>	<u>1952</u>
Training Center	480 hours	480 hours
Soldering	120	120
Assembly	700	520
Electrical Maintenance		160
Radar	3204	1000
Methods	320	280
Production liason	280	400
Production design		300
Maintenance and production		400
Calibration unit		904
Test Devices		400
Plating and Painting	160	
Heat treat	160	
Total	<u>5424</u>	<u>4964</u>

The Training Center mentioned in the foregoing syllabus is a common requirement for all apprentices regardless of craft. The Training Department has a vestibule Training Shop equipped with some fifty or sixty production type machines. Included in the shop are engine lathes, turret lathes, milling machines, drill presses, grinding machines and other types of equipment found on the main production floor. By giving all apprentices an introduction to the machines at this stage they can more easily adjust themselves to the work when they go to the operating departments. The vestibule shop is also utilized for training machine operators and helps justify its existence by producing less complex items that would otherwise be produced by the machine division. A view of the vestibule training shop is shown in Figure 9.

Instructors for shop training are drawn from the more experienced journeymen. Before instructing they are given a thirty hour instructor's training course. This course includes methods of instruction, teaching techniques, practice teaching, instruction steps, job analysis and preparation of instructional material.

Wages. The apprentices at NOPI are employed at a common wage regardless of the craft to which they are apprenticed. At the end of each years apprenticeship there is a uniform increase in pay. The current pay scale for apprentices, compared with the minimum wage of the Electronic



FIGURE 9
VESTIBULE TRAINING CENTER

Mechanic is as follows:

<u>Period</u>	<u>Amount</u>
First Year	\$ 1.23
Second Year	1.35
Third Year	1.47
Fourth Year	1.59
Electronic Mech.	1.92

When the program was established in 1946 the pay scale was as follows:

<u>Period</u>	<u>Amount</u>
First Year	\$ 0.76
Second Year	0.88
Third Year	1.00
Fourth Year	1.12
Electronic Mech.	1.45

Apprentice wages are compared to the Electronic Mechanics' minimum wage since their wage represents the median wage of the crafts apprenticed.

Performance Rating. In order to evaluate the progress of the apprentice in his shop training, the general "performance rating" sheet for all Navy civilian employees is utilized. The present form, in use since 1951, is shown in Figure 10. The worker is adjudged outstanding, satisfactory, or unsatisfactory on the following three factors: quality of work, quantity of work and adaptability. For an overall mark of outstanding the person being rated must

PERFORMANCE RATING			
NAT-100-2230 (3-51)			
TYPE OF RATING		RATING OF RATING	
<input type="checkbox"/> SUPERVISORY	<input type="checkbox"/> MANAGERIAL SUPERVISORY	<input type="checkbox"/> MANAGERIAL SUPERVISORY	<input type="checkbox"/> OFFICIAL <input type="checkbox"/> OFFICIAL
NAME		DATE	
GRADE NO.	POSITION TITLE	DATE, SECTION OR SHOP	
NAME OF ACTIVITY		LOCATION OF ACTIVITY	
EXPLANATION			
Mark characteristic work performance in each factor. In marking supervisors, also consider effectiveness as a supervisor in getting work done.			
DEFINITIONS			
OUTSTANDING - All aspects of performance not only exceeded normal requirements but were outstanding and, in addition, deserved special commendation.			
SATISFACTORY - Acceptable performance that met or exceeded minimum requirements.			
UNSATISFACTORY - Performance that clearly failed to meet minimum requirements.			
FACTORS			
Use O, S, and U to denote Outstanding, Satisfactory and Unsatisfactory performance respectively.			
QUALITY OF WORK	QUANTITY OF WORK	ADAPTABILITY	
— ()	— ()	— ()	
ADJECTIVE PERFORMANCE RATING			
Each "O" or "U" rating must be supported by supervisor's signed statement attached hereto showing specifically and in detail wherein employee's performance was outstanding or unsatisfactory.			
"O" mark in all three factors, fully supported in writing _____ OUTSTANDING — ()			
"S", or "O" and "U" marks _____ SATISFACTORY — ()			
Use or more "U" marks, fully supported in writing _____ UNSATISFACTORY — ()			
REVISIONS NOT OR MORE OUTSIDE OF JUSTIFIED IN WRITING			
DATE OF REVIEW	BY	DATE	
REVIEWED WITH EMPLOYEE BY (Name)	DATE	REVIEWED WITH EMPLOYEE BY (Name)	DATE
REVIEWED BY (Name)	DATE	REVIEWED BY (Name)	DATE
DATE APPROVED BY (Name)	DATE	DATE APPROVED BY (Name)	DATE
NOTICE TO EMPLOYEE			
BY THIS COPY OF YOUR PERFORMANCE RATING FOR THE PERIOD INDICATED YOU ARE NOTIFIED THAT YOUR ADJECTIVE RATING IS AND HOW IT IS NOTIFIED. IF THIS IS AN OFFICIAL RATING YOU HAVE A RIGHT TO APPEAL IT WITHIN 90 DAYS AFTER RECEIPT OF THIS NOTICE. CONSULT YOUR SUPERVISOR OR YOUR PERSONNEL OFFICE AS TO YOUR APPEAL RIGHTS.			

FIGURE 10
PERFORMANCE RATING SHEET

receive "outstanding" on all three factors and have this rating backed up by a written letter explaining why the person is outstanding. A mark of "unsatisfactory" on any of the three factors is termed an unsatisfactory report and must similarly be supported in writing. For a rating of satisfactory, no letter is required.

Prior to the present form, the rating sheet shown in Figure 11 was used. This was a form used specifically for apprentices. This form was divided into five sections. The evaluation of shop performance was made on the basis of ten elements which were rated in five degrees from excellent to unsatisfactory. Numerical weights were printed on the form for each degree with twenty points for excellent, eighteen for very good, sixteen for good, etc. In perusing records of the period 1948 to 1951 (period in which this form was used) it was noted that practically all reports were checked predominantly in the twenty column with occasional checks in the eighteen column.

Other sections of the form gave a record of the shop training completed, current related training evaluation, hours worked, and pertinent remarks.

The form used from 1946 to 1948 is shown in Figure 12 and is a general employee rating sheet. It was based upon the following four factors: knowledge of work, quantity of work, quality of work, and adaptability. Degrees of performance were descriptive. Final rating was determined by

OSDPM-1000-100

This form is to be filled out by the shop in which the apprentice is assigned. Form is to be submitted in quadruplicate for veteran apprentices and in triplicate for new apprentices.

On the last day of each month forward all copies of form to Apprentices Supervisor.

Post data from this form to NAVJIT form (see NAVJIT).

Quadruplicate completed form as follows:

- Copy to apprentice.
- Copy to Veterans Administration if apprentice is a veteran.
- Copy to originating shop for indexing and filing.
- The shop shall forward one copy for filing in the personnel folder; the remaining copy to be kept in the originating shop.

REPORT FOR MONTH ENDING _____

EVALUATION OF	ELEMENTS	RATING					TOTAL OF AVERAGE GRADES
		EXCELLENT	VERY GOOD	GOOD	REASONABLY SATISFACTORY	UNSATISFACTORY	
SHOP PERFORMANCE	KNOWLEDGE OF WORK	20	18	16	14		
	QUANTITY OF WORK (VOLUME)	20	18	16	14		
	QUALITY OF WORK (ACCURACY)	20	18	16	14		
	ADAPTABILITY (INITIATIVE & RESOURCEFULNESS)	20	18	16	14		
	INTEREST IN WORK	20	18	16	14		
SHOP CONDUCT	PUNCTUALITY - ATTENDANCE	20	18	16	14		
	OBEDIENCE	20	18	16	14		
	REGARD FOR SAFETY RULES	20	18	16	14		
	RELIABILITY	20	18	16	14		
	REGARD FOR GOVERNMENT PROPERTY	20	18	16	14		

a Encircle figures indicating appropriate rating on each element. For unsatisfactory rating in any element, insert rating of 10 or less, as warranted by performance of apprentice. A total of these ratings equals the average grade. Ratings totaling 90 or above are satisfactory, 80 or below are unsatisfactory.

AREAS AND ELEMENTS OF TRADE TRAINING		PERFORMED WITH AID (✓)	PERFORMED WITHOUT AID (✓)	ELEMENT COMPLETED DURING MO. (✓)	NO. OF HRS. IN EACH ELEMENT DURING MONTH
NUMBER	DESCRIPTION				

SCHOOL PHASE	SUBJECTS	PERF.	CORG.	WORK HOURS DURING REPORT PERIOD		REMARKS
				NON WORK HOURS	WORK HOURS	
SCHOOL PHASE	MATHEMATICS			TOTAL SHOP HOURS		
	SCIENCE			TOTAL SCHOOL HOURS		
	ENGLISH			TOTAL HOURS		
	HISTORY CIVICS			ANNUAL LEAVE		
	ELEMENTARY SUPERVISION			SICK LEAVE		
	TRADE THEORY			ABSENT W/O AUTH.		
	MECHANICAL DRAWING			ABSENT WITH AUTH.		
	SCHOOL PERFORMANCE GRADE			TOTAL		
	SHOP " "			HOURS FOR PERIOD		
	TOTAL " "			If apprentice is a veteran shop wages received per rep period.		
AVERAGE MONTHLY RATING						
ADJECTIVE RATING						

SIGNATURE (Supervisor of Apprentices) _____ DATE _____

SIGNATURE (Apprentice) _____ INITIALS AND DATE _____

APPRENTICE RATING REPORT NAVJIT-1100 (6-60)

FIGURE II
APPRENTICE RATING REPORT

EMPLOYEE EFFICIENCY RATING SHEET—GROUPS I, II, AND III
NAVJAG FORM 1000, 9-60

Opposite each rating factor, check the block containing the performance description that most nearly represents the employee's characteristic performance. (The rater or reviewer might very well underline each statement, in the block checked, that is typical of the employee's performance.)

2. Base your judgment on the entire period covered and not upon recent incidents alone, taking into consideration whether or not the employee is improving.

NAME	GRADE NO.	PERIOD COVERED BY THIS RATING		KIND OF RATING (✓)	
		FROM	TO	OFFICIAL	UNOFFICIAL
				MODULAR	TRIAL
AS PER	DEPT., DIV., AND UNIT			SPECIAL	REMARKS
RATING FACTORS	A	B	C	D	
KNOWLEDGE OF WORK Consider how well he understands his particular job, and how well he applies his knowledge and experience as a supervisor in actual management.	Exceptionally well informed. Sound and broad knowledge of his job and matters related to it. Acquires knowledge and experience unusually well. Needs practically no supervision.	Well informed. Knows technical operations. Applies knowledge and experience well. Needs very little supervision.	Fairly well informed. Applies knowledge and experience reasonably well. Needs some supervision to secure results.	Inadequate knowledge. Weak in applying knowledge. Needs too much supervision.	
QUANTITY OF WORK Consider the volume of acceptable work, consistent with what he would be expected to accomplish.	Exceptionally high output. A fast and industrious worker at all times.	Consistently turns out a good volume. Meets or exceeds standing requirements.	Usually turns out a passing amount of work. In the quantity of work is about below standing requirements.	Often below minimum requirements.	
QUALITY OF WORK Consider the quantity, timeliness, neatness, and care of work, and the number of errors and omissions.	Exceptionally high quality. Usually exceeds in neatness, accuracy, and minimum omissions.	Does a good quality job. Usually meets standard results. Meets few mistakes.	Quality fairly acceptable, or about average standard results. Needs close supervision to prevent or minimize mistakes.	Quality below minimum requirements.	
ADAPTABILITY Consider his versatility, initiative, resourcefulness, judgment, ability to learn, reliability, and observance of rules.	Exceptionally reliable and cooperative. Justifies all high commendations. Leads by example. Fine judgment in the shop. A self-starter. Highly resourceful. Adapts readily to new conditions.	Reliable and cooperative. Works well with others. Leads well in reasonable time. Very good judgment. Observes rules and follows instructions. Adapts readily to new conditions.	Fairly reliable. Fairly cooperative. Lacks some judgment. Does fairly good judgment. Observes rules fairly well. Sometimes has difficulty in adjusting to new or existing conditions.	A liability. Uncooperative. Is a hindrance to shop results. Frequently disregards rules.	
<p>Comments: (Use any additional facts of performance not fully covered above that serve as a material basis for the rating. This may include the entire employee's performance in terms of attendance or work improvement.)</p>				<p>SUPPLEMENTARY RATING (Check in the appropriate space below: the official rating and results from the other categories above, based on data provided in NUPB 24.12-2)</p> <p>EXCELLENT AND OUTSTANDING</p> <p>GOOD (fully satisfactory)</p> <p>REASONABLY SATISFACTORY (less than good)</p> <p>DISATISFACTORY</p>	
<p>PROGRESS REPORT: This employee's performance since his last official rating for the period ended</p> <p>has: <input type="checkbox"/> IMPROVED <input type="checkbox"/> REMAINED ABOUT THE SAME <input type="checkbox"/> DETERIORATED</p> <p>Should this employee be retained beyond trial period? (Answer ONLY on last regular rating during trial period.) <input type="checkbox"/> YES <input type="checkbox"/> NO</p>					
RATER (Signature)		REVIEWER (Signature)		DATE	
<p>REMARKS (If any):</p>					
<p>SUPERVISOR BY WHOM DISCUSSED (Signature)</p>					
<p>DATE OF DISCUSSION</p>					

10-607215 10-607215-2

FIGURE 12
EMPLOYEE EFFICIENCY RATING SHEET

by a weighting system that could not be determined by the writer, since information of that type was discarded with the innovation of succeeding rating systems.

Apprentice Training Records. Two types of permanent apprentice training records, namely the "Training Schedule and Progress Record" and the "Apprentice School and Shop Accumulative Record," are maintained by the supervisor of apprentices.

The "Training Schedule and Progress Record" is shown in Figure 13. This is a record of hours per month spent in each element as outlined in the shop training syllabus.

Figure 14 shows the "Apprentice School and Shop Accumulative Record". It is a quarterly record of classroom and shop performance marks with a cumulative record of school and shop hours.

Completion Certificate. Upon completion of his training, the NOPI apprentice is given the standard Department of the Navy Certificate of Apprenticeship.

APPOINTMENT DATA

DATE OF APPOINTMENT TO THIS CLASS	CARD _____ OF _____ CARDS
DEPARTMENT	SHOP OR DIVISION

[illegible]

APPRENTICE SHOP TRAINING SCHEDULE AND PROGRESS RECORD - NAVEXOS-2107 (4-51)

(Over)

FIGURE 13
APPRENTICE SHOP TRAINING SCHEDULE & PROGRESS RECORD

NAME AND OTHER PERTINENT DATA

1. For school subjects utilize numerical system or system in use by cooperating school.
2. Mark shop performance: O - Outstanding, S - Satisfactory, or U - Unsatisfactory.

SCHOOL SUBJECT	4th CLASS (QTRS)				3rd CLASS (QTRS)				2nd CLASS (QTRS)				1st CLASS (QTRS)			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
TRADE THEORY																
ENGLISH																
MATHEMATICS																
MECHANICAL DRAWING																
SCIENCE																
HISTORY AND CIVICS																
ELEMENTARY SUPERVISION																
SHOP PERFORMANCE																
REMARKS																

APPRENTICE SCHOOL AND SHOP ACCUMULATIVE RECORD - NAVENOS - 2594(1-50)

50-15604

FIGURE 14
APPRENTICE SCHOOL AND SHOP ACCUMULATIVE RECORD

AN APPRAISAL OF THE APPRENTICE TRAINING PROGRAM,
NAVAL ORDNANCE PLANT, INDIANAPOLIS, INDIANA

Thesis Objective

The objective of this study was to: (1) describe the phases of the NOPI Apprentice Training Program, (2) describe the evolution of the unique procedures, and (3) compare apprentice training methods of the Plant with generally accepted practices in industry.

Apprentice training in American industry has received a new emphasis since the end of World War II. This emphasis is also apparent in the industrial activities of the United States Navy. With the technological advances of the past two decades the Navy has found it necessary to establish development and manufacturing activities to provide the complex ordnance and fire control equipment demanded by modern warfare. To supply these new activities with a continuing source of skilled labor the Navy has instituted apprentice training programs.

The Naval Ordnance Plant, Indianapolis, Indiana, is one of the Naval industrial activities that has instituted an apprentice training program since World War II. This program has received state-wide acclaim from those engaged in the field of apprentice training. This study was undertaken with the assumption that a description of a successful apprentice training program development would be of

value to other activities, both Naval and civilian, interested in setting up or appraising an apprentice training program.

Thesis Criteria

The majority of the material upon which this investigation is based was obtained at the Naval Ordnance Plant. Study of the training files, conferences with the training Director, Supervisor of Apprentices, members of the Board of Review, and personal observation of apprentice selection and instruction techniques resulted in a thorough coverage of the training program operations.

The information gathered and the procedures observed were then compared with the criteria of generally accepted practices in the field of apprentice training. Conferences with the Head of Civilian Training, United States Navy; the Indiana representative of the Bureau of Apprenticeship; officials of the Washington office, Bureau of Apprenticeship; the Director of Vocational Education for the state of Indiana; and the surveys and publications of various authorities on industrial training and vocational education were utilized as the basis for comparison.

Discussion

The Apprentice Board of Review. The Apprentice Board of Review of NOPI differs from the ordinary apprentice

training committee in respect to representation. Whereas the majority of industries have a joint management-labor representation, the NOPI committee is composed of management representatives only. However, it is felt that the best interests of the program are served inasmuch as the Executive Officer represents management, the Training Officer represents education and the Masters of the various production divisions represent the needs of the trade.

Inspection of the minutes of the committee meetings over the years reveal that participation by the committee members was reasonably balanced; however, suggestions of the committee members were not always followed-up. It would appear that a consistent system for introducing program changes would better serve the committee's function.

Supervisor of Apprentices. Mays has commented that: "Where careful supervision of apprentice training is not provided and where the learning on the job is haphazard and unplanned, there is likely to develop in the apprentice much discouragement and frustration."¹¹ Patterson and Hedges stated that: "This man [the apprentice supervisor] can serve to rally all elements within the plant to bring cohesion and teamwork to the project."¹²

¹¹ Arthur B. Mays, Essentials of Industrial Education, (New York: McGraw-Hill Book Company, Inc., 1952), p. 60.

¹² William F. Patterson and M. H. Hedges, Educating for Industry, (New York: Prentice-Hall, Inc., 1946), p. 91.

From these statements and from the practices of other prominent apprentice programs, it may be seen that the position of apprentice supervisor is a key to the success of the apprentice program. Qualifications for apprentice supervisor have been outlined by Patterson and Hedges.¹³ The apprentice supervisor should: (1) have completed a bona fide apprenticeship, (2) have professional familiarity with modern educational theory and practice, (3) have organizational ability, (4) have experience in dealing with youth, (5) have experience in a trade, and (6) have experience as a vocational school coordinator or instructor on apprenticeship matters.

The present NOPI Supervisor of Apprentices meets the majority of the above qualifications. He has held the position of supervisor since the inception of the program and much of the program success can be attributed to him.

Program Standards. The Standards of an apprentice program set forth the rules, regulations, course outlines, and procedures that will be followed. It is the apprentices guide to his course of instruction and should be made readily available to him. NOPI has published their apprentice standards in a mimeographed, bound booklet. A copy is given to each new apprentice. This practice is fairly uniform throughout the majority of programs, since in this manner the apprentice's position in the organization is clearly delineated for him.

¹³Ibid., p. 92.

Cancellation. Cancellation is the term used to refer to the dissolution of an apprentice's training whether due to company action or the apprentices action. Cancellations are a topic dealt with by most authors of apprentice training and vocational education texts. One author expressed the problem as follows: "The cost to industry of the apprentice who does not complete his training is a matter of serious concern. When it is realized that cancellation rates in some cases run as high as 50 percent, it becomes clear how difficult it is to justify the cost of an apprentice program by some industrial plants. It is probable that such huge percentages of cancellation of contracts can be reduced by better organized and managed programs and by more careful selection of trainees."¹⁴

The wide spread concern toward cancellations of those engaged in the field of apprentice training led the Bureau of Apprenticeship in 1950 to make an analysis of the Tennessee Valley Authority apprenticeship program. "This analysis of cancellations which occurred during a 12-year period from one apprenticeship program attempts to measure their extent, their effect upon the apprenticeship program, to offer explanations for their occurrence, and to determine whether it would be reasonable to conclude that improved

¹⁴Arthur B. Mays, Essentials of Industrial Education, (New York: McGraw-Hill Book Company, Inc., 1952), p. 60.

selection would have averted a significant number."¹⁵

The TVA apprenticeship program was chosen for analysis due to the fact that for the ten year period 1936 to 1945, the program averaged only thirty-seven percent cancellations while the national average was approximately fifty percent. "The cancellation rate [of TVA] was considerably lower during peace-time years than during World War II. Only 15 percent of the apprentices who commenced training during the period 1936-1939 failed to complete, as opposed to 44 percent for the war years 1940-1945. Cancellations for the post-war apprentices who commenced training in 1946, 1947, and 1948 cannot be computed until four years after the date of hiring, but indications are that when computed these rates will fall close to the pre-war rates."¹⁶

While possibly not of statistical importance, it is nevertheless interesting to note NOPI's record of apprentice cancellations. Of one hundred and two apprentices employed since December 1946, there have been only five cancellations. Of the three apprentice groups who have completed apprentice training, only one of the forty-eight men failed to graduate. The reason for the recent increase in cancellations is probably due to the required military

¹⁵Cancellations from the Tennessee Valley Authority Apprenticeship Program, 1936-1948, (Washington, D. C.: United States Department of Labor, Bureau of Apprenticeship, June 1950), Introduction.

¹⁶Ibid., p. 2.

service for the newer non-veteran apprentices. Stated in terms of a percentage figure, the NOPI apprentice program has experienced a 2.08 percent cancellation rate.

Selection. In November 1941 the Bureau of Apprenticeship made a survey of the apprentice selection techniques of twenty-one companies. Analysis of the methods used led them to conclude that a good selection procedure would probably include the following steps:

1. Application form may require:
 - a. Minimum age - 16 to 18.
 - b. Minimum education - grammar school.
 - c. Submission of transcript of school grades and character references.
2. Tests - mental ability, mechanical aptitude, mathematical ability.
3. Interview - scientific standards for judgment.
4. Physical examination.¹⁷

The NOPI selection method follows very closely the above recommended procedure with the exception of minimum education requirements. There are no minimum education requirements since success on the test battery gives an indication of educational achievement.

The present selection requirements have been an evolution over a period of years. At various times the Board of Review has considered marital status, military service, desire for training, age, education, and other factors but the present requirements are considered optimum in view of

¹⁷M. A. Lenk, Methods of Selecting Apprentices, (Washington, D. C.: U. S. Department of Labor, Apprenticeship Section, November 1941), p. 16.

their simplicity.

Although no report on the validity and reliability of the selection tests was available, it may be deduced that they are an effective selection aid, inasmuch as no apprentices have been discharged to date for inability to perform their duties. This is true in spite of the high quality standards demanded by Navy Civilian Personnel Instructions.

Although it is beyond the authority of NOPI, it would appear that a reduction in length of the examination could be made without interfering with its effectiveness. Seven hours seems to be an excessive length of time for examination. A study of the individual test questions might well reveal a smaller portion of the questions that are sufficiently discriminating for selection purposes.

Related Classroom Training. Kahler and Hamburger in summing up their findings on related classroom training stated that:

Almost all apprentice standards formulated under the Fitzgerald Act provide for a minimum of 144 hours a year, or about 4 hours a week on the basis of a 38-week school year, to be spent in school. A few standards require 200 hours, while others suggest that school attendance be required only in the first three years of apprenticeship.¹⁸

They further stated that:

The subjects currently taught fall into two main categories. One is fairly general, comprising blue-print reading, drafting, shop mathematics, and safety

¹⁸ Alfred Kahler and Ernest Hamburger, Education for an Industrial Age, (New York: Cornell University Press, 1948), p. 200.

regulations, business English (correspondence, minutes of meetings, and reports on job progress). In the other group, the subjects are more closely related to the trade and are planned separately for each occupation.¹⁹

Whereas the maximum required hours per year of related training noted above was 200 hours, the NOPI program consists of 452 hours per year. Further, the NOPI program includes both categories of subjects. This increase in related training has reduced the number of shop hours required, which has resulted in net required hours for apprentice training of 7488 hours as compared to the 8000 hours minimum of the majority of other programs. This means some 500 less shop training hours required to obtain a journeyman.

One weakness observed in the related classroom training was the lack of standardized instruction from one class to the next. This situation arose due to occasional changes in the teaching staff. To correct this, the training supervisor is now preparing detailed teaching outlines to insure that the subject material taught will be consistent with the designed program objectives.

A problem that is now facing the program is the change in status of the apprentice. Until the present time, the majority of apprentices have been veterans of World War II and the cost of classroom instructors has been borne by the Veterans Administration under Public Law 346. However,

¹⁹Ibid., p. 200.

fewer veterans are now being apprenticed so in the near future new methods of financing the related training program will have to be found. It is hoped that arrangements can be made with the Indianapolis School Board utilizing provisions of the Smith-Hughes and George-Barton Acts. If this alternative is found to be unfeasible, the apprentices can be enrolled in one of the Indianapolis vocational high schools.

Shop Training. Kahler and Hamburger state that:

One of the main problems in establishing the scope of an apprenticeable trade and the length of the period of training is the choice of the number and kinds of operations and processes to be included and their arrangement in working schedules. Every apprenticeship program has a more or less elaborate working schedule, indicating the subjects which must be covered in shop practice and the time to be spent on each. Study of a number of apprentice standards, however, reveals that the working schedules differ not only among the trades but also substantially within the individual trades, and they differ not so much in respect to the subjects covered as in the time distribution and sometimes even in the length of the whole term of apprenticeship.²⁰

The shop training schedule of the NOPI apprentice program stands at one extreme of the problem stated above. Whereas the majority of apprentice programs devote approximately 8000 hours to the trades apprenticed at NOPI, the NOPI program averages about 5700 hours. Figure 15 shows the NOPI distribution of hours for the trade of machinist as compared to several other apprentice programs in the vicinity

²⁰Ibid., p. 191.

PHASE OF SHOP TRAINING	DISTRIBUTION OF HOURS			
	NOPI ¹	PLANT A ²	PLANT B ³	PLANT C ⁴
TRAINING CENTER	4 8 0			
TOOL CRIB	1 2 4	1 4 4	3 0 0	
DRILL PRESS	2 8 0	1 4 4	2 0 0	5 0 0
LATHE	8 0 0	1 0 4 4	1 1 0 0	2 0 0 0
MILLING MACHINE	4 0 0	7 2 0	2 4 0 0	2 0 0 0
GRINDING MACHINE	9 2 0	3 6 0	1 5 0 0	1 5 0 0
HEAT TREAT	2 0 0	2 8 8	3 0 0	
PLATING	1 2 0	1 4 4		
MACHINE REPAIR AND BENCH WORK	3 6 0	1 6 5 6	2 2 0 0	2 0 0 0
ASSEMBLY	4 0 0			
TOOL ROOM	6 7 6			
INSPECTION	3 2 0	4 5 0		
PRODUCTION CONTROL	6 0 0			
SPECIALIZED AND OTHER WORK		2 2 5 0		
TOTAL HOURS	5 6 8 0	7 2 0 0	8 0 0 0	8 0 0 0
¹ NOPI - NAVAL ORDNANCE PLANT, INDIANAPOLIS, INDIANA. ² PLANT A - A MANUFACTURER OF FARM MACHINERY. ³ PLANT B - A MANUFACTURER OF DOMESTIC REFRIGERATION EQUIPMENT. ⁴ PLANT C - A MANUFACTURER OF METAL CONTAINERS.				

FIGURE 15

COMPARISON OF MACHINIST APPRENTICE SHOP TRAINING HOURS
OF SEVERAL INDUSTRIES IN THE VICINITY OF INDIANA

of Indiana. From the variation in hours for the various processes it can be seen that there is no set pattern for trade training. Training officials at NOPI feel that 5700 hours is sufficient shop training due to the preparation the apprentice receives in the vestibule training center and in the related classroom instruction. Another factor is the instructor training course. It is felt that the apprentice learns faster under an instructor who has been taught standardized teaching techniques and who has been shown the apprentice training needs.

Wages. The wages offered the NOPI apprentice as compared to the minimum journeyman wage are compared for the years 1946 and 1953 as follows:

Period	Percent of 1946	Journeyman's Wage 1953
First year	52 %	64 %
Second year	61	70
Third year	69	76
Fourth year	77	84

The Bureau of Apprenticeship, in regard to wages, has stated in its standards that a program should have provisions for "a progressively increasing schedule of wages to be paid the apprentice which, as a minimum, should average over the period of apprenticeship, approximately fifty percent of the rate paid journeymen during that period."²¹

²¹The National Apprenticeship Program, 1952,

It may be noted that the wages in 1946 for NOPI apprentices averaged approximately sixty-five percent of the journeyman's wage which is well above the recommended minimum of fifty percent. Today the average is approximately seventy-three percent. In spite of this high average, the one cancellation in the NOPI program prior to 1950 was by an apprentice who had been offered a wage increase of \$2,000.00 per year as a toolmaker apprentice in another plant.

This situation arises due to the manner in which the wage scale for federal employees is determined. Periodically, a wage survey of the Indianapolis area is made. The NOPI wage scale is then based on an average of the results of this survey. This means that many industries in the area pay much higher wages than NOPI, and therefore NOPI cannot compete with them. The seventy-three percent average wage of the NOPI apprentice is an effort to place him in an equitable position with other apprentices in the area without upsetting the plant pay structure.

Apprentice Rating Forms. The present rating form used by NOPI to evaluate the apprentice violates practically all of the factors enumerated by Tiffin,²² Jucius²³ and

(Washington D.C.: U. S. Department of Labor, Bureau of Apprenticeship, 1952), p. 2.

²²Joseph Tiffin, Industrial Psychology, Third Edition, (New York: Prentice-Hall, Inc.: 1952), pp. 315-359.

²³Michael J. Jucius, Personnel Management, (Chicago: Richard D. Irwin, Inc., 1951) pp. 237-261.

other writers as constituting a good merit rating form.

Among these factors are:

1. Does the information acquired from the rating form meet the objectives of the program?
2. Are the items selected for rating most likely to accurately describe the persons performance?
3. Are the various items arranged in a manner to require individual attention from the rater? That is, do they encourage rating all the items the same due to their physical arrangement.
4. Do the raters have a complete understanding of the various items to be rated?
5. Do the persons being rated accept the form as accurately portraying their performance?

There are other factors, but the ones mentioned serve to point out the fact that the present form does not give an accurate picture of the apprentice's learning rate, his performance as a learner, or the places where he needs concentrated help.

In random queries through the Naval Ordnance Plant, the writer found not one employee who felt that the form accurately portrayed their performance. The common complaint was that the form tended to rate everyone "satisfactory" due to the extra effort involved in rating a worker "outstanding" or "unsatisfactory." The below-average employee receives the same rating as the above-average employee

which tends to develop a "why try" attitude among the better employees. If the form does not give an evaluation of the ordinary employee, it certainly cannot answer the more precise information needed to evaluate the shop performance of the apprentice. If regular merit rating forms are to be used for evaluating the apprentice's shop training, the form first used in 1946 (see Figure 12) certainly gives the most accurate, discriminating picture of where the apprentice stands.

Navy Civilian Personnel Instructions do not restrict the Training Department from using its own methods for evaluating the progress of apprentices. The primary reason for evaluating an apprentice's shop training is to determine if he has acquired the skill necessary to master a particular phase of the program. It would appear that a practical problem, encompassing as many aspects as possible, given at the end of each phase of training would be the most objective approach to rating the apprentices degree of learning. Although admittedly an ambitious project, if a uniform testing procedure were developed for all the phases of shop training, the apprentices training record would show the individuals weak and strong points for use in determining further training, future evaluation, promotion, or special assignment.

Apprentice Training Records. The permanent apprentice records maintained by the Supervisor of Apprentices were

shown in Figures 13 and 14. These forms are issued by the Office of Industrial Relations for the tabulation of information required by that office.

Yoder has stated that records have three principal uses:

They are essential for day-to-day operations, for transfers, promotions, recruitment, and many other functions. They provide the material upon which periodic review and appraisal of the industrial relations program must depend. And, finally, they facilitate research on many personnel functions and activities.²⁴

The apprentice training program, as an integral part of the industrial relations program, should likewise maintain adequate records to satisfy all of the requirements stated above. The present apprentice records of NOPI do not do this. As a result, information that would have been of value in evaluating the program and promoting the individuals has not been recorded. For example, the selection test battery scores of the first classes are not recorded. Too, the various methods of recording related training and shop training grades over the years resists comparative evaluation.

It would appear that information pertinent to the apprentice program would serve best if recorded in a concise set of apprentice records. These records would

²⁴Dale Yoder, Personnel Management and Industrial Relations, Third Edition, (New York: Prentice-Hall, Inc., 1948), p. 785.

consist of:

1. Identification data.
2. Selection data.
3. Record of related training.
4. Record of shop training.
5. Training completion data.

Identification data would consist of those items such as name, clock number, age, trade in which apprenticed, address, and so on.

Selection data would show information considered in the selection process. This would include record of schools attended, grades received in relevant courses, such as algebra, geometry, and physics, selection test battery results, and trade interest questionnaire results.

The record of related training would give the final mark received for each phase of related training. It would also show entrance examination results and reason for granting course credit if attendance was not required.

Record of shop training would be similar to the present form with an additional column for the phase or element grade proposed in the discussion of Performance Ratings. It would also show grants of credit for apprentice training received elsewhere.

Completion data would show dates of promotion through the various classes and date of award of "Certificate of Apprenticeship". If training was not completed, reason for

discharge or withdrawal would be shown.

While only a proposal, information of this type would serve to (1) provide information for compilation of training statistics, (2) aid in determining merit for promotion or further training, and (3) aid in evaluating the apprentices progress.

CONCLUSION

In commenting on modern day apprenticeship, Mays stated that: "The chief characteristic of the new apprenticeship is its recognition of (1) the necessity of cooperation among the three essential elements, namely, education, labor, and employment, and (2) the importance of intelligent supervision of all apprenticeship enterprises."²⁵

In appraising the apprentice training program of the Naval Ordnance Plant, Indianapolis, Indiana, it may be concluded that its success is due to the balancing of the elements listed above. Management has provided the facilities and policy conducive to good training. The related classroom instruction assumes an equitable position in giving the apprentice the necessary knowledge for his craft. The shop training syllabus provides him with the manual skills necessary for journeyman status.

Weaknesses were noted, especially in the maintenance of permanent apprentice records, but in every case the Training Department was in the process of strengthening them.

In terms of the criteria used, NOPI has a well planned and smoothly operated apprentice program. For industrial activities of similar size, the practices of this plant

²⁵Arthur B. Mays, Essentials of Industrial Education, (New York: McGraw-Hill Book Company, Inc., 1952) p. 56.

might readily be adapted. Considering the announced three-fold objective of developing highly skilled artisans, future key employees, and supervisors the program is very satisfactory.

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